

## COASTAL GEOLOGY – LONGSHORE CURRENTS AND SETTLING VELOCITIES

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OK, everyone. We've just moved from the plants and the role that the plants play on the beach to stabilize and keep the sands in place, both on the front of the beach, on the dunes, and behind the dunes. And they have a whole series of adaptations to be able to survive and thrive here on the beach.

Now we are very close to the water. You can hear the water and see the water behind us. And so we're going to look at a different force. We were talking a lot about the wind and the influence of the wind on the plants. Now we're going to talk about the two forces that contribute to the beach and how the beach is built up.

And that's what a beach is. It's an accumulation of sand or sediments. In Florida, that sand is made up of a lot of quartz and also shell material. If we were further north along the East Coast, that would be made up of cobblestone and rock-size grains, versus our sand that's here in Florida.

So what we're going to do is look at the other force, which is the water itself. So the sand moves both from the wind distributes it on the beach face and beyond the beach face, and then the water is what literally washes it up to the beach. Or the water can take that sand away. So we're going to do a couple measurements right now to see how water influences the sand.

We're going to measure a current, which is called a long-shore current. It's unique in that it moves parallel to the shoreline. And its that parallel movement, typically at an angle, that actually distributes sand so that what's happening, for example, on Caladesi is we are building up the beach on one end and we are eroding away the beach on the other end.

So a barrier island is actually always moving ever so slowly. We don't feel that movement, but over time because of the forces of wind and water, we're redistributing those sediments. And what typically happens in Florida, both on the east coast and the west coast where we are, is that predominately the long-shore current moves to the south. So we're actually collecting material north of us, and it's being distributed all the way south down to the Florida Keys.

So we're going to begin by measuring what is the long-shore current. We can feel the wind, but we can't really see the wind. So we see evidence of the wind. We can see the flags moving on our polls here.

And what we've done to measure current, we need two variables. We need a distance and we need a time. So we are going to measure the distance. Each of these polls are five meters apart. And then I have two lovely volunteers in the water for us today who are volunteering to actually release a chemical-- a dye-- into the water, which will make the movement of the water visible.

So right now, we know the water is moving, but we can't really measure that movement because it's not visible enough for us. So I've got some dye here. It's not harmful to the water or the animals in the water, but we're not going to lick our fingers. It's not something we want to consume. But we're going to gently release it in the water and we'll see some dramatic impact as it reacts to water.

So when you mix this with salt water, we'll see a color change. And we'll mark that color change and see how long it takes the parcel of water where our volunteers are to move five meters along the beach. So we'll have time, distance, and we can calculate current speed from that. And this is, again, predominantly how sands get distributed along Florida's coast. OK, let's begin.

Release the dye. Shake it quickly. And now we're going to time it.

So students, what we're doing is from the shore, we were trying to make a prediction what direction the long-shore current would move in. And the force that's actually moving the water is the wind. This would be a surface current, and its orientation just happens to be parallel to the shoreline.

So you'll notice a difference in the way the patch near shore is dispersing itself versus the further offshore patch. We see more movement towards the south of the shallower water patch. And throughout the day, the wind speed has been changing and fluctuating, and that will have an impact on the long-shore current.

The other factor that influences the current is the slope of the bottom and how rapidly the water piles up as it approaches the beach itself. So we have a slow-moving current. We can see a tongue of water moving ahead of the patch. So that's where we would have the most force at this time.

And you can see it's moving across the bottom. The patches are not moving immediately up to shore and crashing on the shore. So this is how the long-shore current is actually gathering up sediment, sand, and moving it parallel to the shore.

Another feature we can see in the water here, on the bottom, we see these ripples that have formed. And this is another indication of the wave action. We can see these ripples that build up sand right along the bottom. We can see these sand ripples on land near the sand dunes. Except in the water, this is the effect of the force of water itself, whereas on land, it would be the wind that's causing that rippling effect in front of the sand dunes.

And now we're going to face shore and see where our time keeper is. So this is a way to visually see one of the slower moving currents in the ocean-- the long-shore current. And as the wind speed picks up and the distance that the wind is moving, the current speed will also increase and how fast the sediments are distributed.

It's 438 on the outside one.

OK, I've got to write those down. We'll record our data, and then we can calculate our wind speed.